

Considerably larger doses of egg albumen, peptone and dried whole pituitary gland suspensions failed to produce similar changes in control animals.

In a further series of experiments, a number of epinephrectomized rats were injected with high doses of the corticotrophic hormone preparation. The kidneys of some of these animals showed similar though less pronounced changes to those observed in rats with intact adrenals.

The occurrence of these kidney changes after injection of the hormone might be ascribed to either of two factors, if it is possible to rule out a direct toxic action due to the concentration of some substance during the process of purification. These possibilities are: (a) an effect of the anterior pituitary hormone on the accessory adrenals; (b) a direct action of the purified corticotrophic hormone on the kidneys.

The first possibility would appear to be more acceptable, as Selye¹, with overdosage of desoxycorticosterone acetate, has produced nephrosclerotic changes in the kidneys of young chicks. Other investigations² point in the same direction.

It may also be remembered that pathological changes of the kidneys and the kidney function have been observed in cases of Cushing's syndrome, a disease in which a hyperexcretion of corticotrophic hormone³ and of cortine⁴ has been demonstrated.

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¹ Selye, H., *Canad. Med. Assoc. J.*, **47**, 515 (1942).

² Winter, C. A., and Ingram, W. R., *Amer. J. Physiol.*, **139**, 710 (1943); *Federation Proc.*, **2**, 55 (1943). Clinton, jun., M., and Thorn, G. W., *Science*, **66**, 343 (1942). Spingarn, C., Mulinos, M. G., and Maculla, E., *Federation Proc.*, **2**, 93 (1943). Hamed, A. S., and Nelson, W. O., *Federation Proc.*, **2**, 19 (1943). Plantoni, C., and Orfas, O., *Rev. soc. argentina biol.*, **18**, 326 (1942).

³ Jores, A., *Z. exp. Med.*, **97**, 622 (1936). Reiss, M., *Klin. Wochenschr.*, **16**, 937 (1937); *J. Ment. Sci.* (July 1939).

⁴ Anderson, E., Haymaker, W., and Joseph, M., *Endocrinol.*, **23**, 398 (1938).

Optical Phenomena in the Atmosphere

THE "Solar Halo Phenomenon" described by G. H. Archenhold in *Nature* of September 30 was referred to in recent correspondence in *The Times* and was explained in a short article by me in *The Times* of August 31. The occurrences of August 9 seem to have been particularly striking.

Accounts from meteorological observers have made it fairly certain that the "dark bands moving like waves" or ripples across solar optical phenomena are connected with sound waves from explosions. I saw some in France during the War of 1914-18 on the occasion of a series of big explosions, though at that time the connexion with sound waves was not appreciated¹.

It seems that the sound waves passing through the air can affect two types of optical phenomena: (1) the type such as iridescence which depends on diffraction of light through minute water droplets; and (2) the type depending on reflexions in ice crystals floating with their axes in a fixed direction.

In the first type, as a result of the sequence of adiabatic warmings and coolings produced in the cloud by the explosion waves, the sizes of the cloud droplets diminish and increase respectively. With

the changes in the size of the cloud particles, changes in the interference colours and thus in the iridescence are brought about. It might at first sight seem that changes in size of water drops could not take place sufficiently quickly to render sound waves visible in this way; but according to theoretical calculations made by Findeisen and experiments on artificial fogs made by H. Mache about 1933, the rate of evaporation of water droplets can actually be sufficiently great in the very small droplets characteristic of thin, newly formed clouds.

In the ice crystal type of phenomenon, it is presumably the momentary displacements caused by the explosion waves in the lie of the crystal axes which cause the ripple effect. The angular speed of the ripples mentioned by G. H. Archenhold (5° per second) would give the velocity of sound at a distance of some 12,000 feet, though the height of the cloud trail was much more likely to have been about twice as great. The band width mentioned ($\frac{1}{3}^\circ$) or the distance between bands ($\frac{1}{3}^\circ-1^\circ$) would correspond to a very low frequency sound which, however, is a characteristic of heavy explosions.

It may be relevant to mention here another kind of optical phenomenon which has recently been described in letters to *The Times* and discussed in an article on September 3 under the heading of "Flying Bomb Waves". Such waves have been seen by observers of nearby explosions and have been described as "a faint but distinct line in the form of a seemingly perfect arc centred on the spot where a bomb had disappeared". These effects are connected with the explosion wave within a few hundred yards of the explosion itself, and it seems that the curved line represents the hemispherical wave of compressed air. In this case the optical effect might arise either from evaporation of water droplets in cloudy air or even as a refraction (mirage) effect from the relatively steep gradient of air density. Calculation of the effect produced by a ton of high explosive suggests that either effect is physically possible up to a radius of the order of 500 yards from the exploding bomb, provided the bomb explodes before burying itself in the ground or in buildings, and assuming the observer to be suitably placed—say, half a mile distant—to view the effect.

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¹ *Q. J. Roy. Met. Soc.*, **45**, 366 (1919).

THE arc through the sun described by Mr. C. J. P. Cave¹ can only, I fear, be identified with the horizontal circle and not with some rare tilted arc. Its identity is clear from the fact that it passed both through the sun and through the parhelia to the 22° halo, which have the same altitude as the sun. The impression of upward tilting, due to perspective, was unquestionably enhanced by the comparatively high sun and the small amount of the circle that was visible; a lower sun and a more extensive development of the circle make it clear that all parts of it are the same distance from the horizon. The apparent tilting is an effect with which Mr. Cave will certainly be familiar from observations of clouds.

I have advisedly used the word 'tilted', since the word 'vertical' is inadmissible in the sense used by Mr. Cave. Haloes are, of course, simply rays of light